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(54) **NONBULKY ANKLE BRACE FOR USE WITH FOOTWEAR**

WENIG AUFTRAGENDE SPRUNGGELENKSTÜTZE FÜR SPORTSCHUHE

ATTELLE DE CHEVILLE NON ENCOMBRANTE A UTILISER AVEC UNE CHAUSSURE

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Description

BACKGROUND OF THE INVENTION

1) Field of the Invention

[0001] The present invention is related to the field of orthopedic braces, and in particular, braces for supporting the ankle of a wearer during sports and other activities.

2) Description of Related Art.

[0002] Over the past few decades participation in various sports activities by both men and women has experienced explosive growth. The increase in participation has also led to an increase in the incidence of sports-related injuries. Many of these activities require high-speed running with rapid directional changes, or "cutting," such as soccer and football. Cutting motions subject an athlete's ankle joint to extremely large forces which may result in a traumatic injury. In addition, such forces over time tend to decrease the stability of the ankle joint by increasing the drawer, or range of anterior-posterior and medial-lateral sliding motion, of the foot with respect to lower leg. Instability in the ankle increases the risk of the eventual occurrence of a traumatic injury. Traumatic injury often occurs with inversion, or eversion, of the foot. Inversion occurs when the athlete plants her foot to resist a large lateral force and the athlete's foot rolls onto its lateral surface while the lower leg (or tibia) remains relatively upright. Eversion occurs in the opposite direction, where the athlete's foot rolls onto its medial surface. Both motions can result in a soft-tissue injury, such as a sprain, or even a bone fracture. For instance, inversion can result in a Weber fracture, which is a fracture of the distal fibula.

[0003] Various taping methods have been developed to increase the stability of an already-injured, or unstable, ankle joint. The application of tape, however, takes a significant amount of time and effort and may result in reduced circulation in the foot which is uncomfortable for the wearer. In addition, the tape cannot be easily removed, and when removed cannot be reapplied or reused. As a solution to this, ankle braces have been developed that typically include a canvas or leather sleeve extending over the ankle similar to the upper of a high-top basketball shoe with a plurality of laces and eyelets for a tensioned closure. Despite the additional support provided by such braces, tightening and loosening of the laces can be burdensome. In addition, canvas and leather are not very breathable materials causing the buildup of moisture during activities and making the brace uncomfortable for the wearer.

[0004] An ankle brace shown in Figures 6(a) and 6(b) of U.S. Patent No. 5,393,303 to Shiono discloses a main body 1 constructed of a laminated, three-layer fabric and including a lower leg covering portion 2 and a foot covering portion 4 between which is defined a heel opening 13. The laminated fabric has a polyurethane, non-woven fabric as a core material, a "sweat-in" and "sweat-out" polyester fabric as the inner layer, and a polyamide stretch French pile as the outer layer. Two stretch belts 20, 21 extend over the foot and ankle and cross each other to attach to the French pile via VELCRO fasteners 20a and 21a, as shown in Figure 1 of Shiono. Also, binding belts 15, 16, 17 and 18 wrap around and secure the shank portion of the main body to the leg. A pair of molded stays 22, 24 are mounted to the main body under the binding belts, as shown in Figures 3 and 4 of Shiono. The use of the laminated fabric for the main body improves the removal of moisture and sweat from the skin of the wearer. However, Shiono's ankle brace is too bulky for use with most footwear and therefore is of limited use to an active wearer wishing to prevent, as well as rehabilitate, an injury.

[0005] GB -A-224 1170 discloses an ankle brace for comfortably supporting an ankle of a wearer by inhibiting motion between a foot and lower leg of a wearer, while simultaneously wicking moisture away from the foot, ankle and lower of the wearer comprising

- a leg portion constructed of a flexible sheet material configured to embrace the lower leg of the wearer and to extend distally along the lower leg to the ankle, said leg portion defining an opening for receiving the lower leg of the wearer;
- lateral and medial stays constructed of a relatively rigid material and configured to extend along portions of the lower leg and ankle, said lateral and medial stays attached to respective lateral and medial sides of the leg portion so as to inhibit relative motion between the foot and lower leg of the wearer; and
- a strapping unit including a foot portion and a pair of straps, connected thereto, said strapping unit constructed of a single piece of moisture-wicking sheet material, said foot portion coupled to the leg portion at the ankle and configured to extend along and under at least portions of the foot, said straps configured to extend upwards from the foot portion.

[0006] Therefore, it would be advantageous to have an ankle brace that is not too bulky to be useable with footwear during athletic activities. In addition, it would be advantageous to have an ankle brace that is comfortable to wear, especially during activities requiring exertion that produces heat and moisture within the brace. Further, it would be advantageous to have an ankle brace that combines comfortable wear with sufficient support to prevent ankle injuries.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention addresses the above needs and achieves other advantages by providing an ankle brace for comfortably supporting an ankle of a

wearer by inhibiting motion between a foot and lower leg of the wearer. A foot portion and leg portion of the ankle brace are formed of a laminated, moisture-wicking material that improves wearability during athletic activities. The leg and foot portions are combined with medial and lateral stays that are supported within pockets of the leg portion so as to provide medial and lateral stability for the ankle. A strapping unit is used to further improve stability via a pair of straps that are formed of the same piece of laminate material as the foot portion and extend upwards from the foot portion to cross over the ankle and attach to the leg portion. Advantageously, constructing the straps from the same piece of material as the foot portion eliminates fasteners and their attendant bulk and allows the ankle brace to be used with off-the-shelf footwear.

[0008] In one embodiment, the present invention includes an ankle brace for comfortably supporting an ankle of a wearer by inhibiting motion between a foot and lower leg of the wearer. The ankle brace includes a leg portion constructed of a flexible sheet material configured to embrace the lower leg of the wearer and to extend distally along the lower leg to the ankle. The flexible sheet material defines an opening for receiving the lower leg of the wearer. Lateral and medial stays are constructed of a relatively rigid material and are configured to extend along portions of the lower leg, ankle and foot of the wearer. The lateral and medial stays are attached to the lateral and medial sides of the leg portion, respectively, so as to inhibit motion between the foot and lower leg of the wearer. The ankle brace also includes a strapping unit, comprising the aforementioned foot portion and a pair of cross-straps, constructed of a single piece of moisture-wicking, laminate sheet material. The foot portion is coupled to the leg portion at the ankle and is configured to extend along and under at least a portion of the foot. The cross-straps are configured to extend upwards from the foot portion and cross over each other at the ankle, attaching to the leg portion. Use of the strapping unit further inhibits relative motion of the foot and lower leg while the laminate sheet material wicks away moisture from the wearer's foot, ankle and lower leg.

[0009] In one aspect of the invention, each of the stays can include a rib or ribs extending along the stay so as to increase its rigidity. Further, the stays may each define a notch that is sized and shaped to receive the malleolus of the wearer. The leg portion can further include lateral and medial pockets configured to hold the lateral and medial stays, respectively.

[0010] Preferably, the laminate material includes an inner moisture-wicking ply, an outer elastic ply and a foam core between the inner and outer plies. The flexible sheet material of the leg portion may also be constructed of a laminate material having moisture-wicking properties. The leg and foot portions can be coupled by being stitched together along adjacent edges meeting at the ankle of the wearer.

[0011] The ankle brace may also include one or more lower leg straps that extend around the leg portion so as to bind it to the lower leg of the wearer. In one embodiment, loop material is disposed on the leg portion to provide a surface for attachment of each of the straps having ends with a hook material disposed thereon.

[0012] Wearer comfort, and the ability to insert the ankle brace into conventional footwear that has little front-to-back adjustability, can be further facilitated by the foot portion defining heel and toe openings.

[0013] Among other advantages, the ankle brace of the present invention supports the wearer's ankle while having minimal bulk and therefore being useable with conventional footwear. Further, the use of a single piece of laminate material for the strapping system eliminates the need for overlapping material or fasteners to attach the cross-shaps to the foot portion. Elimination of the overlap and fasteners further reduces bulk and facilitates use of the ankle brace with footwear. Use of a laminate material with wicking properties keeps the ankle, foot and lower leg of the wearer dry during athletic activities. The optional rib on each of the stays improves the stiffness of the stay without adding appreciable weight or bulk to the ankle brace.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0014] Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

Figure 1 is a perspective view of one embodiment of an ankle brace of the present invention secured to an ankle of a wearer;

Figure 2 is another perspective view of the ankle brace of Figure 1;

Figure 3 is yet another perspective view of the ankle brace of Figure 1, but opened and ready to receive the ankle of the wearer;

Figure 4 is a side elevation view of a relatively rigid stay of the present invention for use with the ankle brace shown in Figure 1;

Figure 5 is a side elevation view of another stay of the present invention including a reinforcement rib;

Figure 6 is a sectional view of a laminate material used to construct a strapping system of the ankle brace shown in Figure 1;

Figure 7 is a sectional view of a laminate material used to construct a leg portion of the ankle brace shown in Figure 1;

Figure 8 is a sectional view of the laminate material of the leg portion shown in Figure 7, the stay of Figure 4 and a stay cover shown in Figure 2 holding the stay to the leg portion;

Figure 9 is a perspective view of another embodiment of an ankle brace of the present invention;

Figure 10 is another perspective view of the ankle

brace of Figure 9; and

Figure 11 is yet another perspective view of the ankle brace of Figure 9, but opened and ready to receive the ankle of the wearer.

DETAILED DESCRIPTION OF THE INVENTION

[0015] The present inventions now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[0016] An ankle brace **10** of one embodiment of the present invention is illustrated in Figures 1 and 2. The ankle brace includes a leg portion **11** extending along and embracing a lower leg **50** of the wearer. A foot portion **12** wraps under a portion of a foot 52 of the wearer and is attached to the leg portion **11** approximately at an ankle of the wearer. Extending upwards from the foot portion **12** are a pair of cross-straps **13** that cross over the ankle and attach to opposite sides of the leg portion **11.** The ankle brace **10** is ambidextrous and can be used on either a left or right foot.

[0017] The leg portion **11** is formed of a sheet of flexible material and in the illustrated embodiments has the shape of a cuff, defining a top edge **17** and a pair of opposing front edges **18.** The top edge 17 extends around the lower leg **50** of the wearer, preferably roughly at the midpoint of the lower leg, thereby encircling a large part of the wearer's calf. The pair of opposing front edges **18** extend downwards along the front of the wearer's shin and ankle. In combination, the top and front edges **17,18** of the leg portion **11** define an opening for receiving the lower leg **50** therein in an embracing fit. The geometry of the leg portion **11** and its opening preferably allows it to fit a large number of persons, such as 20% of the female population and 95% of the male population. At a fit of 20% of the female population, the brace **10** forms about an 20,3 cm (8 inch) circle around the lower leg above the malleoli. At a fit of 95% of the male population, the brace forms about a 25,4 cm (10 inch) circle around the lower leg above the malleoli.

[0018] Preferably, the leg portion **11** is constructed of a laminate having multiple plies, including a soft, moisture-wicking material as its inner, sldn-adjacent ply **20** and an outer ply **21,** as shown in Figure 7. The laminate of the leg portion **11** may also include a foam core **22** sandwiched between the skin-adjacent ply **20** and the outer ply **21.** Preferable materials for the outer ply **21,** core ply **22** and inner ply **20** are VELCRO laminates of ORTHOWICK (a lightly-napped tricot), 3,18 mm (0.125 inch) G45 and ORTHOWICK, respectively, or ORTHOWICK, 3,18 mm (0.125 inch) G45L (a urethane foam), tricot with zero stretch, respectively. Advantageously, the ORTHOWICK or tricot inner ply of the laminate is worn against the skin and has a low skin irritant, soft feel and moisture-wicking properties.

[0019] The ankle brace **10** may include a leg strap **14** that encircles the top of the leg portion **11,** holding the front edges **18** together so that the leg portion **11** firmly embraces the lower leg **50** of the wearer. The leg strap **14** includes an elongate strip of material attached at one end to one of the front edges **18** and having a hook material pad or patch **16** on its other end. Optionally, on the opposite one of the front edges, across from the attachment of the leg strap **14,** a buckle **33** can be attached having an opening therethrough sized to receive the free end of the leg strap **14,** as shown in Figures 9-11. Once passed through the buckle **33,** the strap **14** is reversed back on itself and pulled tight to draw the front edges **18** together. The strap **14** is wrapped around the leg **50** and its free end is secured via the hook material patch **16** to the loop material on a stay cover **19,** which is in turn attached to the outer ply **21** of the leg portion **11.**

[0020] The stay cover **19** is supported on the medial and lateral sides of the leg portion **11** and forms pockets therewith, as shown best in Figures 2 and 10. The stay cover **19** is formed of a separate sheet attached via stitches **23** extending through the sheet and the material of the leg portion **11.** Preferably, the pockets formed by the stay cover **19** each have a shape congruent with the shape of one of a pair of stays **15,** as will be described hereinafter. More particularly, each of the pockets formed by the stay cover **19** extends downwards along the medial or lateral side of the lower leg **50** and curves forward along a portion of the foot **52** after passing over the ankle. Other shapes are possible for the pockets formed by the stay cover **19** depending upon the desired size and shape of the stays **15.** The stay cover is preferably constructed of an outer unbroken-loop material (UBL) that is VELCRO hook 88 compatible, a urethane backing and an inner, elastic liner preferably of DARLINGTON (MOORE) CG25530-1090 162 Black 62 elastic, as shown in Figure 8. Although use of the stay cover **19** is preferred, the stays **15** can also be fastened, or secured, against the leg portion **11** using other devices, such as additional straps, pads of hook material on the stays or an overlying elastic sleeve.

[0021] In the illustrated embodiment, each of the stays **15** has an "L-shape" (as shown in Figures 4 and 5) and is configured to extend along a portion of the lower leg **50,** over the ankle and a portion of the foot **52** (as shown in Figures 2 and 10) within a respective one of the pockets formed by the stay cover **19,** as shown in **Figure 8. In this manner, the stays 15 are rendered relatively immobile on the** medial and lateral sides of the brace **10** and provide rigid reinforcement for the ankle. In addition, the stays **15** act as a supplement to the wearer's proprioception, allowing the wearer to sense and react to excessive inversion or eversion of the foot **52.** Preferably, the stays **15** are injection molded from a low density polyethylene, although other materials could also be used,

such as lightweight metals, plastics or wood. The stays can also be stamped from a synthetic sheet material and can have other shapes depending upon the amount and location of needed support. Preferably, each of the stays has a thickness of about 2,29 mm (.090 inches).

[0022] Optionally, each of the stays **15** may be shaped to accommodate the shape of the wearer's leg, ankle and foot anatomy. For instance, the stay may be curved at its upper end to follow the curve of the lower leg **50,** or may define a notch **24** at its rear (posterior) edge sized and shaped to correspond to the malleolus of the wearer. As another option, each of the stays **15** may include a rib **25** (or ribs) that further stiffen the stay against bending loads, as shown in Figure 5. The rib or ribs may have different geometries and configurations, but preferably the rib is a single ridge extending along the portion of the stay adjacent to the lower leg **50** and ends at the portion of the stay over the ankle. Other configurations could include several parallel ribs extending along the leg-adjacent portion of the stay, and along the foot-adjacent portion. Preferably, the rib **25** or ribs have a relatively low profile that minimizes the bulkiness of the stays **15** and the stay cover **19,** thereby providing strength while still allowing use of the brace **10** with conventional footwear. For instance, the rib could be an additional 2,29 mm (. 090 inches) of thickness over the preferred 2,29 mm (. 090 inches) of thickness of the base stay material, for a total of 4,57 mm (.180 inches).

[0023] The foot portion **12** and cross-straps **13** are preferably constructed from a single piece of laminate material and together form a strapping unit. Preferably, the single piece of laminate material is a two-axis stretch urethane laminate with an inner ply **34** of lightweight sueded polyester stretch French terry, a lightweight polyester outer jersey ply **35,** and a core polyurethane foam **36** sandwiched between the inner and outer plies, as shown in Figure 6. The preferred thickness of the single piece laminate material is about 1,27 mm to 2,79 mm (. 05 .11 inches) at 3450 N/m^2 (0.5 psi). Other laminate materials could also be used, provided that material is thin enough to allow the wearer to also wear a conventional shoe over the foot portion **12,** and strong enough to provide support, along with the leg portion **11** and the stays **15,** against inversion and eversion of the foot. Preferably, however, the laminate also includes the moisture-wicking, padding and elastic qualities of the above-described terry/foam/jersey laminate. The foot portion **12** and cross-straps **13** may also be constructed of separate pieces of laminate material joined together; although not as preferred as the single-piece strapping unit due to the need for stitching and/or overlap, the multi-piece strapping unit would still have moisture wicking properties.

[0024] Similar to the leg portion **11,** the foot portion **12** of the illustrated embodiments has the shape of a cuff formed of a sheet material (the aforementioned laminate), except that the cuff extends under the foot **52** and upwards on both the medial and lateral sides of the foot to become the cross-straps **13** as shown in Figures 1-3 and 9-11. A rearmost end of the foot portion attaches near the ankle to the medial and lateral sides of the leg portion **11** via lines of stitching **26.** Optionally, the leg portion **11** and foot portion **12** together define a heel opening 27 that receives a heel **54** of the wearer's foot **52.** In addition, the forward or anterior end of the foot portion **12** defines a toe opening **28** through which extends the toes **55** of the wearer's foot **52.** Advantageously, the heel and toe openings **27, 28** facilitate use of the brace **10** with most conventional footwear, which typically is not adjustable in the front-to-back direction. Optionally, the ankle brace **10** may include a tongue **31** constructed of a flexible material, such as LYCRA, that extends between the medial and lateral sides of the foot portion **12** and over the instep **56** of the foot **52,** as shown in Figure 3. The tongue **31** serves to hold the opposing medial and lateral sides of the foot portion together and can protect the instep **56** of the foot somewhat from chafing by the cross-straps **13.** In addition, the tongue could also extend over the upper ankle or leg **50.**

[0025] Each of the pair of cross-straps **13** extends at one end from, and as part of the same piece of material as, a respective medial or lateral side of the foot portion **12.** The other end of each of the pair of cross-straps **13** includes a hook material pad **29.** When the ankle brace **10** is being worn, the cross-straps **13** extend upwards over the respective medial and lateral top surfaces of the foot **52** and cross over each other at the instep and/or anterior ankle.

[0026] After crossing, each of the cross-straps **13** wraps around, and attaches to, an opposite side of the leg portion **11** via the hook material pad **29,** as shown in Figures 1 and 9. Each hook material pad **29** attaches to the loop material on the outside of the stay cover **19.** The lateral one of the cross-straps **13** extends upwards from the lateral side of the foot **52** and attaches to the medial side of the leg portion **11,** while the medial one of the cross-straps **13** does the opposite. Either one of the straps **13** may be on the outside and the strapping unit will still be equally effective at securing the ankle brace **10.**

[0027] During use, the wearer pulls apart the opposing front edges **18** of the leg portion **11** to the configuration illustrated in Figures 3 or 11, and slides the foot **52** into the foot portion **12,** under the flexible tongue **31** (if present such as in the embodiment in Figure 3), until the toes **55** extend through the toe opening **28** and the heel **54** extends through the heel opening **27.** Meanwhile the leg portion **11** is pulled up onto about the mid-point of the lower leg **50.** The cross-straps **13** are crossed over each other at the instep **56** and anterior portion of the ankle. The cross-straps are pulled tight and the hook material pad **29** at the end of each of the cross-straps is attached to the hook-engageable stay cover **19** on the medial or lateral side of the leg portion **11** opposite from the side of the foot portion **12** on which the respective strap originated. At the top of the leg portion **11,** the free end of the lower leg strap **14** is threaded outwards through the

buckle 33 on the opposite one of the opposing edges **18** and wrapped back on itself. The leg strap **14** is extended around the leg portion **11,** pulled tight to hold the edges **18** together, and the hook material **16** on its free end is secured to the adjacent loop material on the hook engageable stay cover **19.** The wearer is then free to insert the foot **52** and ankle brace **10** into a running shoe, or other athletic footwear for support during activities.

[0028] Among other advantages, the ankle brace **10** of the present invention supports the wearer's ankle while having minimal bulk and therefore being useable with conventional footwear. Further, the use of a single piece of laminate material for the strapping system eliminates the need for overlapping material or fasteners to attach the cross-straps **13** to the foot portion **12.** Elimination of the overlap and fasteners further reduces bulk and facilitates use of the ankle brace **10** with footwear. Use of a laminate material with wicking properties keeps the ankle, foot **52** and lower leg **50** of the wearer dry during athletic activities. The optional rib **25** on each of the stays **15** improves the stiffness of the stay without adding appreciable weight or bulk to the ankle brace **10.**

[0029] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. An ankle brace (10) for comfortably supporting an ankle of a wearer by inhibiting motion between a foot (52) and lower leg (50) of the wearer, while simultaneously wicking moisture away from the foot, ankle and lower leg of the wearer, said ankle brace (10) comprising:

- a leg portion (11) constructed of a flexible sheet material configured to embrace the lower leg (50) of the wearer and to extend distally along the lower leg to the ankle, said leg portion (11) defining an opening for receiving the lower leg (50) of the wearer;
- lateral and medial stays (15) constructed of a relatively rigid material and configured to extend along portions of the lower leg and ankle, said lateral and medial stays (15) attached to respective lateral and medial sides of the leg portion (11) so as to inhibit relative motion between the foot and lower leg of the wearer; and
- a strapping unit including a foot portion (12) and a pair of straps (13), connected thereto, said strapping unit constructed of a single piece of moisture-wicking sheet material, said foot portion coupled to the leg portion (11) at the ankle and configured to extend along and under at least portions of the foot, said straps configured to extend upwards from the foot portion (12),

characterised in that

- the stays (15) extend also along a portion of the foot (50) of the wearer,
- the strapping unit is constructed of a laminate sheet material and
- the straps (13) are cross-straps and are configured to cross over each other at the ankle and attach to the leg portion (11) so as to further inhibit relative motion of the foot and lower leg while the laminate sheet material wicks away moisture from the wearer's foot, ankle and lower leg.

2. An ankle brace of Claim 1, wherein at least one of the stays (15) includes at least one stiffening rib (25).

3. An ankle brace of Claim 2, wherein the rib (25) extends vertically along the stay (15).

4. An ankle brace of Claim 1, wherein the laminate material includes an inner moisture-wicking ply (20), an outer elastic ply (21) and a foam core (22) between the inner and outer plies.

5. An ankle brace of Claim 1, wherein the leg portion (11) includes lateral and medial pockets configured to hold the lateral and medial stays (15).

6. An ankle brace of Claim 1, wherein the flexible sheet material of the leg portion (11) is a laminate material having moisture-wicking properties.

7. An ankle brace of Claim 5, wherein the leg (11) and foot (12) portions are stitched together at the ankle.

8. An ankle brace of Claim 1, wherein the stays (15) define a notch sized and shaped to comfortably receive a malleolus of the wearer.

9. An ankle brace of Claim 1, further comprising a lower leg strap (14) configured to encircle and bind the leg portion (11) to the lower leg (50) of the wearer.

10. An ankle brace of Claim 1, wherein the leg portion (11) includes an outer surface having one of a loop and hook material disposed thereon, and each of the straps have an end with the other one of the loop and hook material disposed thereon.

11. An ankle brace of Claim 1, wherein the foot portion (12) defines a heel opening (27).

12. An ankle brace of Claim 1, wherein the foot portion (12) defines a toe opening (28).

13. An ankle brace of Claim 2, wherein the rib (25) extends vertically along the stay (15).

14. An ankle brace of claim 1 wherein

- the leg portion (11) constructed of a flexible sheet material configured to embrace the lower leg (50) of the wearer by extending around the posterior, medial and lateral sides of the lower leg (50) and by extending distally along the lower leg to the ankle and said flexible sheet material including an upper edge;
- the lateral and medial stays (15) held to respective lateral and medial sides of the leg portion (11) by a stay panel attached to the leg portion and extending over the stays;
- the foot portion (12) constructed of a laminate, moisture-wicking sheet material, attached to the leg portion at the ankle and defining heel (27) and toe (28) openings, said foot portion configured to extend under at least a portion of the foot.

Patentansprüche

1. Sprunggelenkstütze (10) zum komfortablen Stützen eines Sprunggelenks eines Trägers durch Inhibierung der Bewegung zwischen einem Fuß (52) und dem Unterschenkel (50) des Trägers, während gleichzeitig Feuchtigkeit vom Fuß, Sprunggelenk und Unterschenkel des Trägers weg transportiert wird, wobei die Sprunggelenkstütze (10) Folgendes aufweist:

- einen Beinabschnitt (11), der aus einem flexiblen Flächenmaterial konstruiert und so konfiguriert ist, dass er den Unterschenkel (50) des Trägers umgibt und sich distal entlang dem Unterschenkel bis zum Sprunggelenk erstreckt, wobei der Beinabschnitt (11) eine Öffnung zur Aufnahme des Unterschenkels (50) des Trägers definiert,
- eine laterale und eine mediale Verstärkung (15), die aus einem relativ starren Material konstruiert und so konfiguriert sind, dass sie sich entlang Abschnitten des Unterschenkels und des Sprunggelenks erstrecken, wobei die laterale und die mediale Verstärkung (15) so an einer jeweiligen lateralen und medialen Seite des Beinabschnitts (11) angebracht sind, dass sie relative Bewegung zwischen dem Fuß und dem Unterschenkel des Trägers inhibieren, und
- eine Gurtbandeinheit mit einem Fußabschnitt (12) und einem Paar damit verbundener Gurtbänder (13), wobei die Gurtbandeinheit aus einem einzigen Stück feuchtigskeitstransportierendem Flächenmaterial konstruiert ist, der Fußabschnitt am Sprunggelenk an den Beinabschnitt (11) gekoppelt und so konfiguriert ist, dass er sich entlang von und unter mindestens Abschnitten des Fußes erstreckt und die Gurtbänder so konfiguriert sind, dass sie sich vom Fußabschnitt (12) nach oben erstrekken,

dadurch gekennzeichnet, dass

- sich die Verstärkungen (15) ebenfalls entlang einem Abschnitt des Fußes (50) des Trägers erstrecken,
- die Gurtbandeinheit aus einem Laminatflächenmaterial konstruiert ist und
- es sich bei den Gurtbändern (13) um Kreuzgurtbänder handelt, die so konfiguriert sind, dass sie sich am Sprunggelenk überkreuzen und am Beinabschnitt (11) angebracht werden, um relative Bewegung des Fußes und Unterschenkels weiter zu inhibieren, während das Laminatflächenmaterial Feuchtigkeit vom Fuß, Sprunggelenk und Unterschenkel des Trägers weg transportiert.

2. Sprunggelenkstütze nach Anspruch 1, wobei mindestens eine der Verstärkungen (15) mindestens eine Versteifungsrippe (25) aufweist.

3. Sprunggelenkstütze nach Anspruch 2, wobei sich die Rippe (25) vertikal entlang der Verstärkung (15) erstreckt.

4. Sprunggelenkstütze nach Anspruch 1, wobei das Laminatmaterial eine innere feuchtigkeitstransportierende Lage (20), eine äußere elastische Lage (21) und einen Schaumstoffkern (22) zwischen der inneren und der äußeren Lage aufweist.

5. Sprunggelenkstütze nach Anspruch 1, wobei der Beinabschnitt (11) laterale und mediale Taschen aufweist, die so konfiguriert sind, dass sie die laterale und die mediale Verstärkung (15) aufnehmen.

6. Sprunggelenkstütze nach Anspruch 1, wobei das flexible Flächenmaterial des Beinabschnitts (11) ein Laminatmaterial mit feuchtigkeitstransportierenden Eigenschaften ist.

7. Sprunggelenkstütze nach Anspruch 5, wobei der Bein- (11) und der Fußabschnitt (12) am Sprunggelenk zusammengenäht sind.

8. Sprunggelenkstütze nach Anspruch 1, wobei die

Verstärkungen (15) eine Kerbe definieren, die so bemessen und geformt ist, dass sie einen Malleolus des Trägers bequem aufnehmen.

9. Sprunggelenkstütze nach Anspruch 1, ferner mit einem Unterschenkelgurtband (14), das so konfiguriert ist, dass es den Beinabschnitt (11) umgibt und an den Unterschenkel (50) des Trägers bindet.

10. Sprunggelenkstütze nach Anspruch 1, wobei der Beinabschnitt (11) eine Außenfläche mit einem darauf angeordneten Klettverschlussmaterialteil aufweist und die Gurtbänder jeweils ein Ende haben, an dem der jeweils andere Klettverschlussmaterialteil angeordnet ist.

11. Sprunggelenkstütze nach Anspruch 1, wobei der Fußabschnitt (12) eine Fersenöffnung (27) definiert.

12. Sprunggelenkstütze nach Anspruch 1, wobei der Fußabschnitt (12) eine Zehenöffnung (28) definiert.

13. Sprunggelenkstütze nach Anspruch 2, wobei sich die Rippe (25) vertikal entlang der Verstärkung (15) erstreckt.

14. Sprunggelenkstütze nach Anspruch 1, wobei

- der Beinabschnitt (11) aus einem flexiblen Flächenmaterial konstruiert und so konfiguriert ist, dass er den Unterschenkel (50) des Trägers umgibt, indem er sich um die hintere, die mediale und die laterale Seite des Unterschenkels (50) herum erstreckt und sich distal am Unterschenkel entlang zum Sprunggelenk erstreckt, und wobei das flexible Flächenmaterial einen oberen Rand aufweist,
- die laterale und die mediale Verstärkung (15) durch ein Verstärkungsfeld, das am Beinabschnitt angebracht ist und sich über die Verstärkungen erstreckt, an der jeweiligen lateralen und medialen Seite des Beinabschnitts (11) gehalten werden, und
- der Fußabschnitt (12) aus einem feuchtigkeitstransportierenden Laminatflächenmaterial konstruiert ist, am Sprunggelenk am Beinabschnitt angebracht ist und eine Fersen- (27) und eine Zehenöffnung (28) definiert, wobei der Fußabschnitt so konfiguriert ist, dass er sich unter mindestens einem Abschnitt des Fußes erstreckt.

Revendications

1. Attelle de cheville (10) pour supporter de façon confortable la cheville d'un utilisateur en empêchant tout mouvement entre un pied (52) et une jambe inférieure (50) de l'utilisateur, tout en absorbant simultanément l'humidité générée par le pied, la cheville et la jambe inférieure de l'utilisateur, ladite attelle de cheville (10) comprenant:

- une partie de jambe (11) constituée d'une matière en feuilles flexible configurée pour envelopper la jambe inférieure (50) de l'utilisateur et pour s'étendre de façon distale le long de la jambe inférieure jusqu'à la cheville, ladite partie de jambe (11) définissant une ouverture destinée à recevoir la jambe inférieure (50) de l'utilisateur;
- des renforts latéraux et médiaux (15) constitués d'une matière relativement rigide et configurés pour s'étendre le long de parties de la jambe inférieure et de la cheville, lesdits renforts latéraux et médiaux (15) étant attachés à des côtés latéraux et médiaux respectifs de la partie de jambe (11) de manière à empêcher tout mouvement relatif entre le pied et la jambe inférieure de l'utilisateur; et
- une unité de cerclage (12) et une paire de sangles (13) connectées à celle-ci, ladite unité de cerclage étant constituée d'une seule pièce de matière en feuilles d'absorption d'humidité, ladite partie de pied étant couplée à la partie de jambe (11) au niveau de la cheville et étant configurée pour s'étendre le long et en dessous d'au moins quelques parties du pied, lesdites sangles étant configurées pour s'étendre vers le haut à partir de la partie de pied (12);

caractérisée en ce que:

- les renforts (15) s'étendent aussi le long d'une partie du pied (50) de l'utilisateur;
- l'unité de cerclage est constituée d'une matière en feuilles stratifiée; et
- les sangles (13) sont des sangles transversales et sont configurées pour se croiser mutuellement au niveau de la cheville et pour être attachées à la partie de jambe (11) de manière à empêcher en outre tout mouvement relatif du pied et de la jambe inférieure alors que la matière en feuilles stratifiée absorbe l'humidité générée par le pied, la cheville et la jambe inférieure de l'utilisateur.

2. Attelle de cheville selon la revendication 1, dans laquelle au moins un des renforts (15) comprend au moins une nervure de raidissement (25).

3. Attelle de cheville selon la revendication 2, dans laquelle la nervure (25) s'étend verticalement le long du renfort (15).

4. Attelle de cheville selon la revendication 1, dans laquelle la matière stratifiée comprend une couche intérieure d'absorption d'humidité (20), une couche

extérieure élastique (21) et un noyau en mousse (22) placé entre les couches intérieure et extérieure.

5. Attelle de cheville selon la revendication 1, dans laquelle la partie de jambe (11) comporte des poches latérales et médiales configurées pour soutenir les renforts latéraux et médiaux (15).

6. Attelle de cheville selon la revendication 1, dans laquelle la matière en feuilles flexible de la partie de jambe (11) est une matière stratifiée qui présente des propriétés d'absorption d'humidité.

7. Attelle de cheville selon la revendication 5, dans laquelle les parties de jambe (11) et de pied (12) sont jointes l'une à l'autre par piquage au niveau de la cheville.

8. Attelle de cheville selon la revendication 1, dans laquelle les renforts (15) définissent une encoche dimensionnée et configurée pour recevoir de façon confortable la malléole d'un utilisateur.

9. Attelle de cheville selon la revendication 1, comprenant en outre une sangle de jambe inférieure (14) configurée pour encercler et lier la partie de jambe (11) à la jambe inférieure (50) de l'utilisateur.

10. Attelle de cheville selon la revendication 1, dans laquelle la partie de jambe (11) comprend une surface extérieure comportant une première matière de type velcro disposée sur celle-ci, et chacune des sangles présente une extrémité comportant une autre matière de type velcro disposée sur celle-ci.

11. Attelle de cheville selon la revendication 1, dans laquelle la partie de pied (12) définit une ouverture de talon (27).

12. Attelle de cheville selon la revendication 1, dans laquelle la partie de pied (12) définit une ouverture d'orteils (28).

13. Attelle de cheville selon la revendication 2, dans laquelle la nervure (25) s'étend verticalement le long du renfort (15).

14. Attelle de cheville selon la revendication 1, dans laquelle:

- la partie de jambe (11) est constituée d'une matière en feuilles flexible configurée pour envelopper la jambe inférieure (50) de l'utilisateur en s'étendant autour des côtés postérieurs, médiaux et latéraux de la jambe inférieure (50) et en s'étendant de façon distale le long de la jambe inférieure jusqu'à la cheville, et ladite matière en feuilles flexible comportant un bord supérieur;
- les renforts latéraux et médiaux (15) sont maintenus sur les côtés latéraux et médiaux respectifs de la partie de jambe (11) par un panneau de renfort attaché à la partie de jambe et s'étendant sur les renforts; et
- la partie de pied (12) est constituée d'une matière en feuilles stratifiée d'absorption d'humidité, attachée à la partie de jambe au niveau de la cheville et définissant des ouvertures de talon (27) et d'orteils (28), ladite partie de pied étant configurée pour s'étendre en dessous d'au moins une partie du pied.

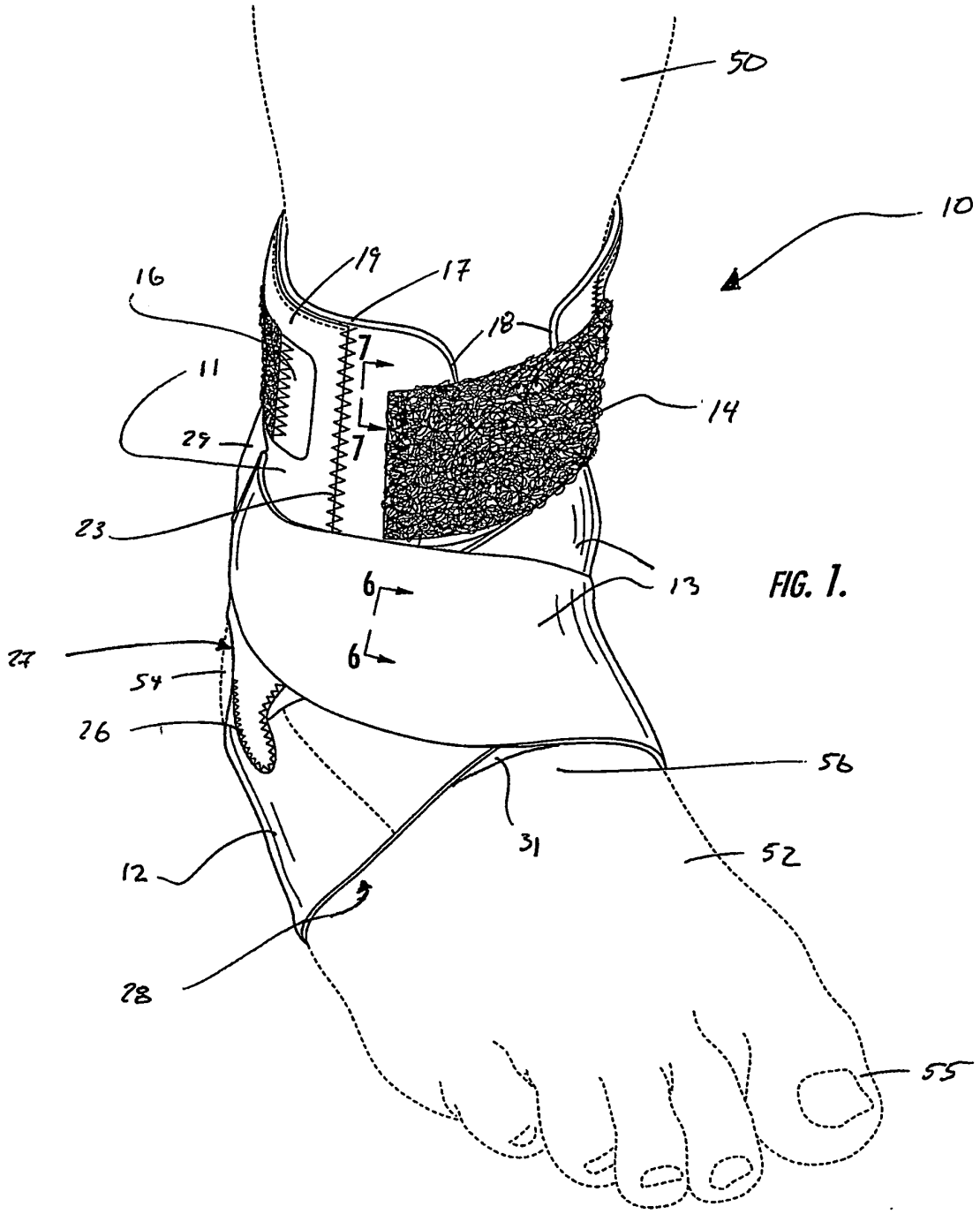

FIG. 1.

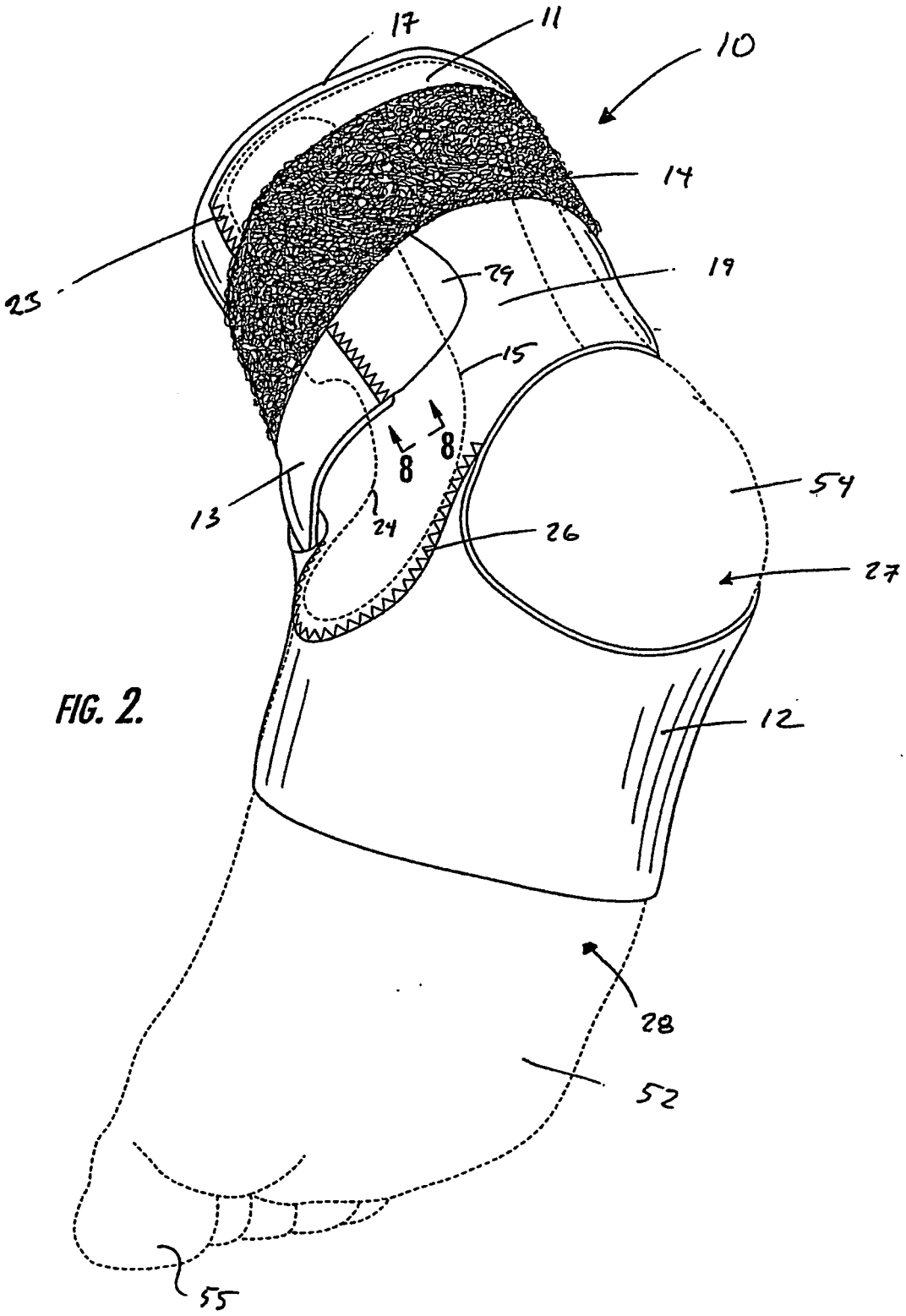

FIG. 2.

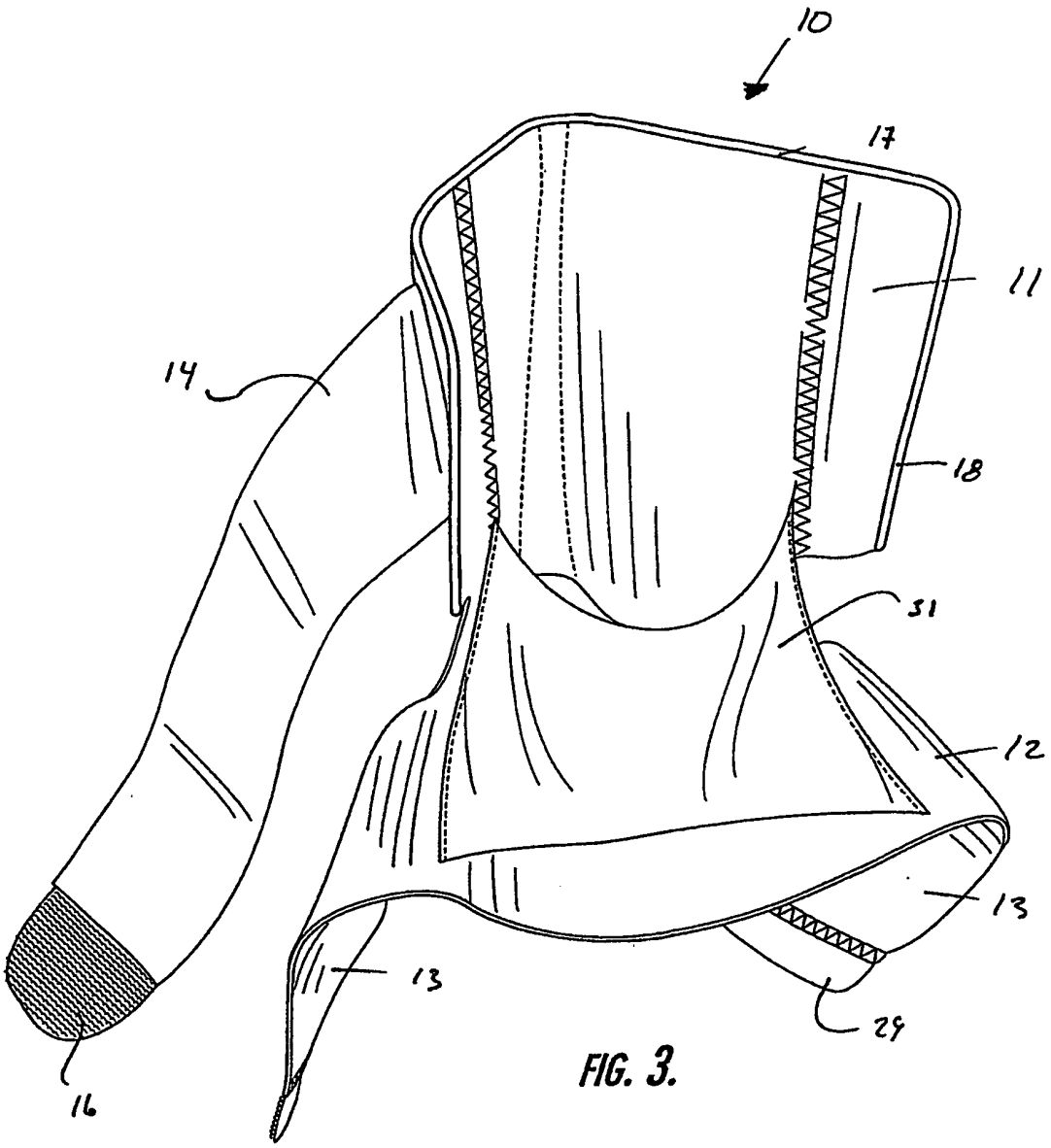

FIG. 3.

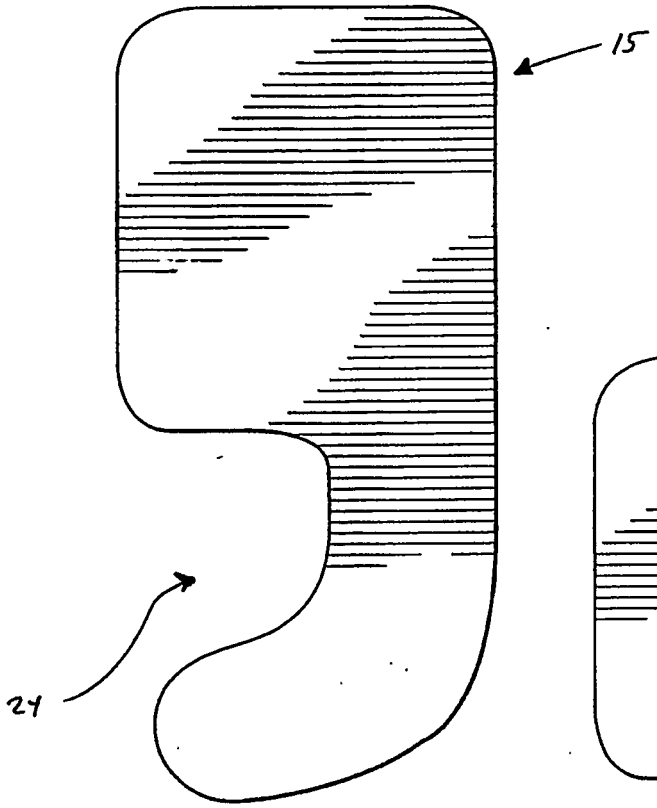

FIG. 4.

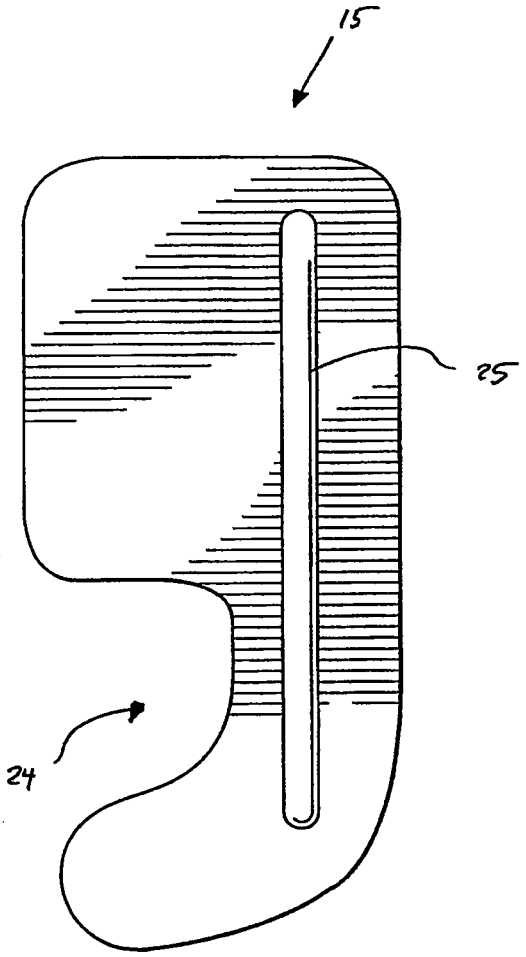

FIG. 5.

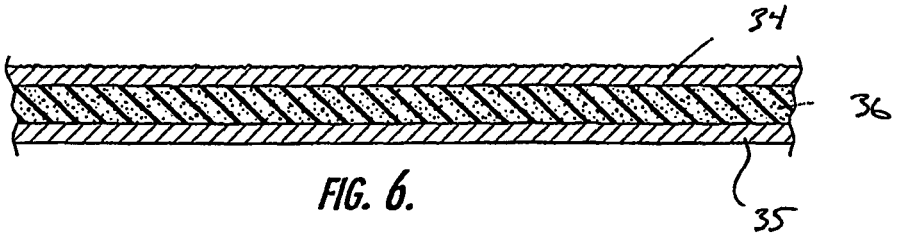

FIG. 6.

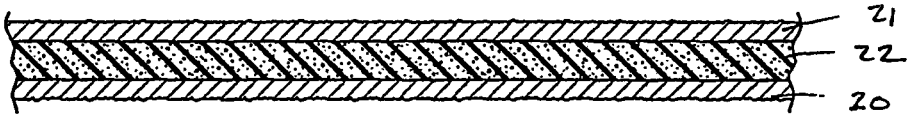

FIG. 7.

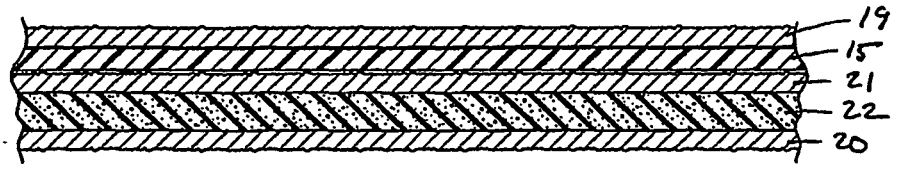

FIG. 8.

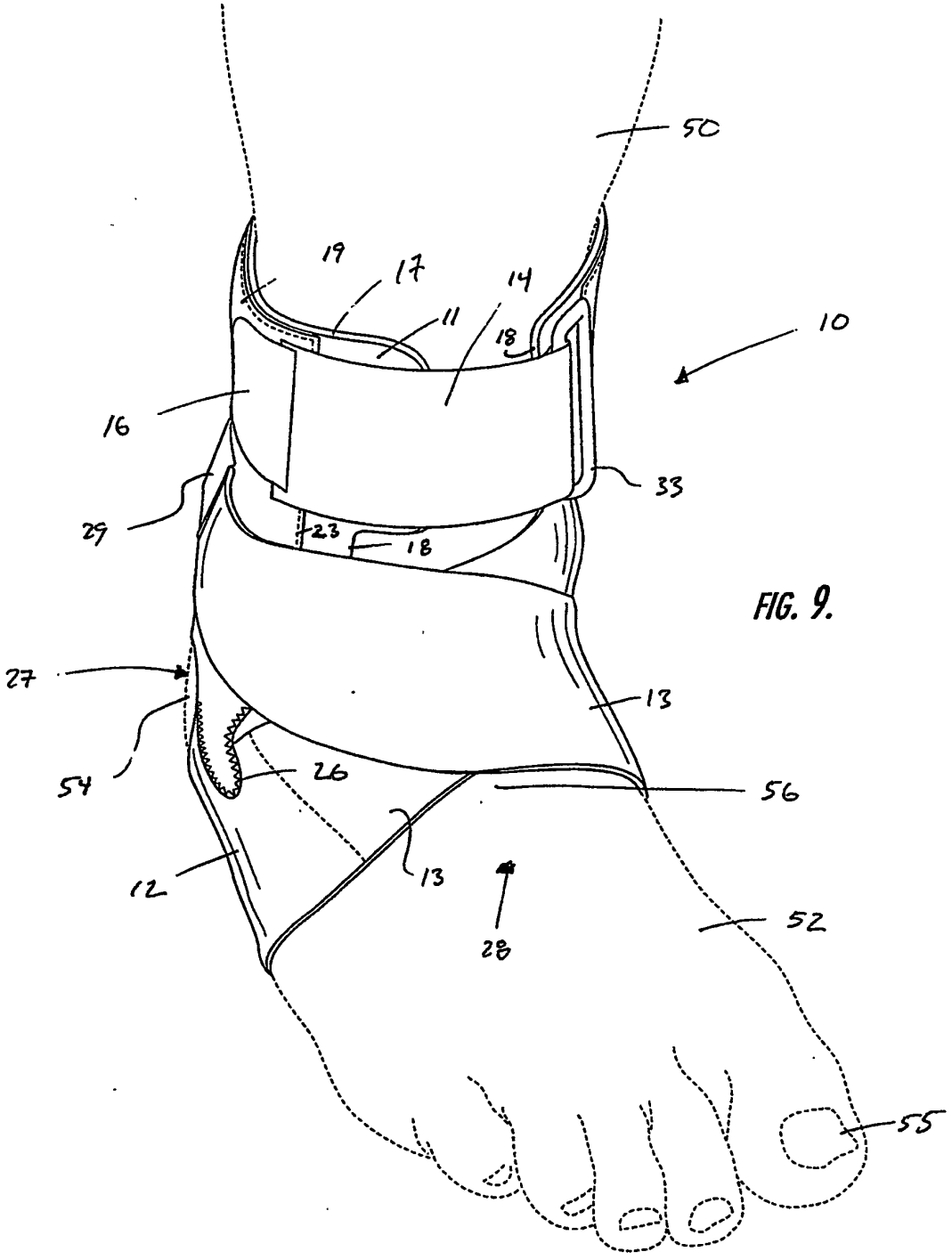

FIG. 9.

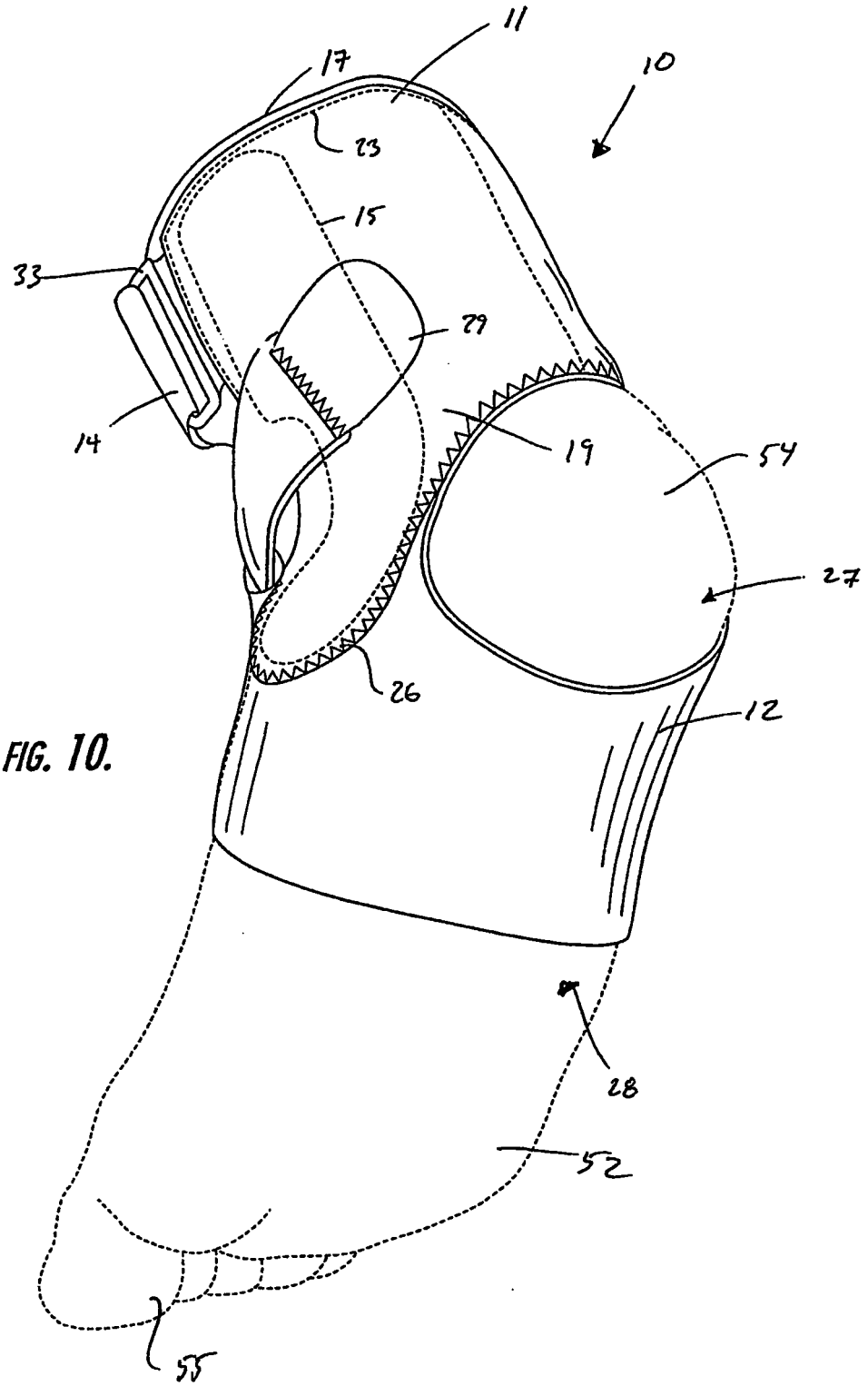

FIG. 10.

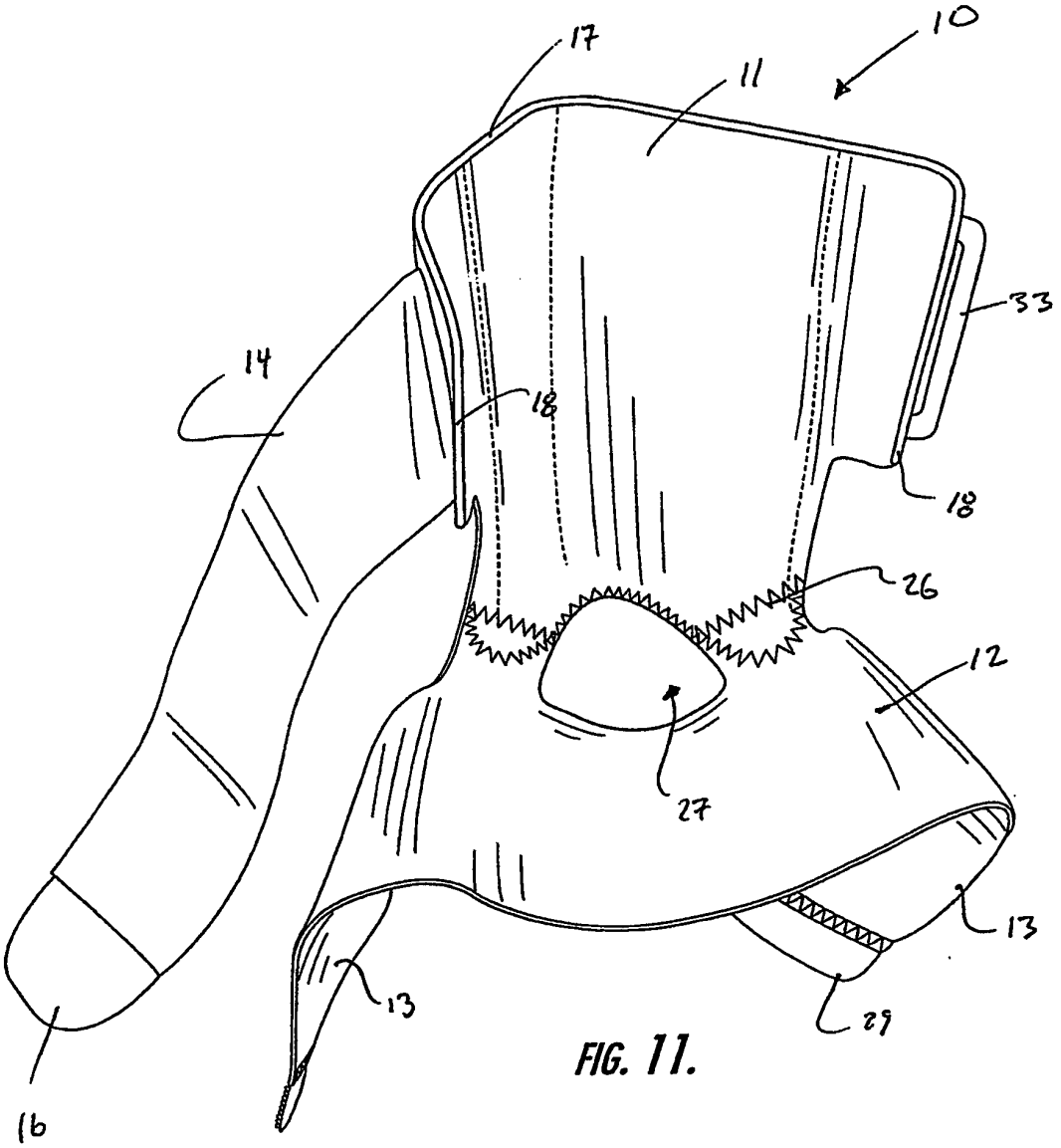

FIG. 11.

REFERENCES CITED IN THE DESCRIPTION

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